U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/84-06(DRSS)

Docket No. 50-255 License No. DRP-20

Licensee: Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Facility Name: Palisades Nuclear Generating Plant

Inspection At: Palisades Site, Covert, MI

Inspection Conducted: March 22-23 and April 27, 1984

Inspectors: P. C. Lovendale for — 7/10/84 Date

L. R. Greger — 7/10/84 Date

Approved By: L. R. Greger, Chief
Facilities Radiation Protection
Section — 7/10/84 Date

Inspection Summary

Inspection on March 22-23 and April 27, 1984 (Report No. 50-255/84-06(DRSS))
Areas Inspected: Nonroutine, announced inspection of the circumstances surrounding the unplanned exposure of a diver during underwater maintenance of the refueling cavity tilt machine. Also, the status of licensee actions taken to satisfy the requirements of NUREG-0737 Item II.B.3 was reviewed. The inspection involved 36 inspector-hours onsite by two NRC inspectors. Results: Of the two areas inspected, no violations were identified in one area. Four violations were identified in the remaining areas (dose to a worker in excess of 10 CFR 20.101 limits - Section 6, failure to provide proper monitoring and controls for high radiation areas access - Section 4, failure to follow radiation protection procedures - Section 5, and failure to maintain records of surveys - Section 4).

DETAILS

1. Persons Contacted

R. Clendenning, Radiation Safety Supervisor - Dose Control
R. DeLong, Health Physicist - ALARA
*R. English, Corporate Health Physicist
M. Erwin, Dosimetry Crew Leader (Contractor)
S. Johnson, Radiation Protection Crew Leader (Contractor)
A. Kahn, Senior Chemist - Technical Support
D. Malone, Licensing Engineer
*R. Montross, Plant Manager
*W. Mullins, Chemistry and Health Physics Superintendent
J. Pendergast, Radiation Protection Crew Leader
J. Rang, Operations and Maintenance Superintendent
*D. Rogers, Technical Engineer
B. Rundlett, Radiation Protection Crew Leader
W. Teegardin, Diver (Contractor)
D. Vandenburg, Technical Staff Engineer

B. Jorgensen, NRC Senior Resident Inspector

The inspectors also interviewed several other licensee and contractor personnel including radiation protection technicians, divers, and members of the technical staff.

*Denotes those present at the exit meeting.

2. General

This inspection, which began at 12:00 noon on March 22, 1984, was conducted to review the circumstances surrounding an unplanned exposure to a diver while he was performing underwater maintenance on the refueling cavity tilt machine. During the inspection, several persons who were involved with the incident were interviewed, including plant radiation protection technicians, contracted radiation protection technicians, divers, members of plant health physics management, and members of the engineering staff. Also, documentation related to the event was reviewed, including summary reports, incident critique minutes, technician statements, dosimetry data, and survey data. In general, the licensee's review of this incident appears to have been well organized and documented.

3. Sequence of Events

March 14, 1984: The fuel transfer tilt machine (upender) on the spent fuel pool (SFP) side was found inoperable due to hydraulic system leaks. The licensee decided to use divers to perform the needed repairs. Another option considered was to drain the refueling cavity and then perform the needed repairs. However, this option was determined to be less desirable due to time and exposure considerations.

March 15, 1984: Preparations were made for the repair work to be accomplished by divers. A radiation work permit (RWP) was written, an ALARA review conducted, and an underwater survey of the SFP tilt machine area was performed. The maximum general area dose rate was 100 to 150 mrems/hour. Following these preliminary activities, the first dive into the SFP tilt machine area was conducted. No problems or unusual radiation fields were noted.

March 16 1984: The dives into the SFP tilt machine area continued. Except for delays due to problems with the underwater detector, the dives progressed without incident. Due to the nature of the hydraulic system problems found on the SFP tilt machine, similar problems were suspected to exist on the refueling cavity tilt machine. An underwater survey of the refueling cavity tilt machine area was conducted in preparation for possible repairs. The results of this survey indicated radiation levels ranging form 350 to 900 mrem/hour in the refueling cavity tilt machine area, significantly higher than the SFP side. The refueling cavity tilt machine hydraulic system was air tested and found to be leaking (one hose). It was determined that all hydraulic hoses on the refueling cavity tilt machine would be replaced.

March 17, 1984: The SFP tilt machine repairs were completed. One diver was used for the work; his total dose was approximately 1350 mrems. Other than survey instrument malfunctions, no problems or unusual exposures were noted during the SFP tilt machine repairs. Survey instrument problems are discussed further in Section 4. An RWP for the refueling cavity tilt machine repairs was generated utilizing the survey information from the underwater survey conducted on March 16, 1984. In addition to the underwater radiation levels, the RWP indicated contamination levels of 200 mrad/hour per 100 cm^2 smear (based on a January 1984 survey when the tilt machine area was drained) and an estimated person-rem exposure of 2 rems. No ALARA review was conducted for this RWP. Underwater detector problems again caused delays such that repairs to the refueling cavity tilt machine were postponed.

March 18, 1984 (B shift): "B" shift radiation protection crew members stated that underwater surveys of the refueling cavity tilt machine area were conducted, but were not documented. They stated that the maximum dose rates found during these surveys ranged from 1000 to 7000 mrems/hour. Reporting and recording of these and other surveys is discussed further in Section 4. The dosimetry crew leader completed the needed jump ticket (stay time calculation). The resulting 10-minute stay time calculated for the first dive was based on 10 R/hr radiation levels measured in January 1984, when the refueling cavity was drained. The refueling cavity dives were scheduled for the afternoon shift (C shift).

March 18, 1984 (C shift): Diving operations into the refueling cavity tilt machine area began. A total of three dives were completed. After needed dosimetry was attached both inside and outside the diver's suit, the first dive was conducted. This dive lasted for 10 minutes between approximately 1555 and 1605. Following the diver's exit from the water,

the outside dosimetry was read (the inside dosimetry was not removed) and a maximum average dose rate determined based on the dosimetry results and stay time. This dose rate, 1500 mrems/hour, was increased by one-third and used to calculate a 60-minute stay time for the second dive. However, because of uncertainties concerning the diver's working position (may have to lie down on the floor), only a 30-minute stay time was allowed. Following the first dive, the tilt machine was raised to allow better access to the hydraulic equipment near the bottom of the cavity. The only underwater surveys of the refueling cavity tilt machine areas reported performed during this shift were between the first and second dives, following repositioning of the tilt machine and carriage. These surveys, which reportedly agreed with the 1500 mrems/hour calculated from the diver's dosimetry, were not documented. Following the second dive, which lasted for 28-minutes between approximately 1735 and 1803, all the diver's inside and outside secondary dosimetry was read. The maximum average dose rate determined from these TLDS was about 2000 mrems/hour. Based on this dose rate and the diver's remaining allowable dose, a 40-minute stay time was calculated for the third dive. Following the third dive, which lasted for 35-minutes between approximately 2138 and 2213, all the diver's inside secondary TLDs and outside self-reading dosimeters were read (no outside secondary TLDs were used during the third dive). The maximum recorded dose was 3611 mrems to the right thigh just above the knee, approximately twice the expected dose. According to TLD data, the total dose to the right thigh for all three dives was 4462 mrems. This was the highest recorded dose for any portion of the diver's body. The duty health physicist was informed of the unanticipated exposure (and potential overexposure). The duty health physicist issued a stop work order on all diving operations and notified the Plant Health Physicist and Duty and Call Superintendent.

March 19, 1984: Beginning shortly after midnight, several underwater surveys of the refueling cavity tilt machine area were conducted. These surveys indicated numerous radiation hot spots ranging from 1000 to 30,000 mrems/hour. At about 0530 the diver's GO TLD badge was driven to the corporate office for reading. The badge read 4630 mrems. The Plant Manager (acting) informed the NRC Senior Resident Inspector of the incident and formed a special investigation team to review the incident. This team consisted of the Chemistry and Health Physics Superintendent, the Corporate Health Physicist, and a Shift Engineer.

Over the following three days the investigating team reviewed procedures, conducted critiques, inspected the work site and observed an underwater survey of the refueling cavity tilt machine area, reviewed numerous dosimetry and survey records, and interviewed some of the persons involved. The work performed by the team was compiled into a report to the Plant Manager. Copies of this report were provided to the inspectors for their review.

March 22-23, 1984: With the aid of the divers, the licensee attempted to decontaminate the refueling cavity tilt machine area. This was accomplished using a hose, pump, and filter assembly to remove

accumulated silt and debris from the tilt machine area. This effort required about five hours of diving time. Although general area radiation levels were reduced, post-decontamination surveys indicated that many significant radiation hot spots, measuring up to 15,000 mrems/hour, remained.

March 24, 1984: A diver was used to perform a detailed underwater survey of the tilt machine area. Following the survey, a prejob briefing was conducted and the machine repairs completed. This effort required about two hours of diving time and a dose of 75 mrems to the diver.

4. Surveys and Instrumentation

Discussions with persons involved in the diving operations revealed that several surveys of the refueling cavity tilt machine area were conducted before and during the dives, including a survey on January 19, 1984, with the refueling cavity and tilt machine pit drained; two surveys on March 16, 1984; two surveys on the "B" shift of March 18, 1984; and one or possibly two surveys (conflict in technician statements) between the first and second dives on the "C" shift of March 18, 1984. Except for a survey using TLDs on March 16, 1984, all underwater surveys were conducted using a "cutie pie" CP-MU equipped with a large volume (about 150 cubic inches) ionization chamber. The TLD survey conducted on March 16, 1984, revealed a maximum dose rate of 66 mrems/hour. This survey information was discounted by the dosimetry crew leader because the TLDs were not properly placed in the work location, the TLD exposure time was questionable, and the dose rate was very low compared to prior surveys. The March 16, 1984 cutie pie survey revealed dose rates in the tilt machine area ranging from 350 to 900 mrems/hour. The two surveys conducted on March 18, 1984, during the "B" shift indicated dose rates ranging from 1000 to 7000 mrems/hour, about seven times higher than the dose rates previously measured. The surveys on March 18, 1984, between the first and second dives during the "C" shift revealed dose rates ranging from 1500 to 2000 mrems/hour. The survey of the tilt machine area on January 19, 1984, when the cavity was drained, indicated dose rates of up to 15,000 mrems/hour.

Except for surveys on March 16, 1984, none of the refueling cavity tilt machine area underwater surveys were documented until the March 19,1984, surveys performed after the incident. Also, it appears that the results of key surveys, such as the March 18, 1984 "B" shift surveys (1000 to 7000 mrems/hour), were not communicated to responsible health physics supervision or oncoming radiation protection crew members. "B" shift radiation protection crew members stated that they recalled discussing the results of their surveys during shift turnover with oncoming "C" shift radiation protection crew members. However, "C" shift radiation protection crew members stated that they did not receive the survey information, and no record of these surveys was made for use by the oncoming "C" shift. Knowledge of this survey data by the "C" shift radiation protection crew members would likely have resulted in adoption of further precautions including reduced stay times, and ultimately may have minimized the diver's exposure.

Failure to document and maintain records of needed surveys appears to be a violation of 10 CFR 20.401, which requires that records of surveys be maintained. (255/84-06-01)

Based on interviews with persons involved, it appears that on March 18 only check surveys were conducted on the "B" shift and following the first after repositioning the tilt machine and carriage, and that no survey was conducted following the second dive. The detector was submerged in the water but was on the refueling cavity floor rather than in the tilt machine pit. The diver was not utilized to maneuver the detector in order to obtain representative readings in the work area; nor was the diver required to carry the detector with him so that work area dose rate changes could be monitored.

Failure to provide the diver with a radiation monitoring device for use in surveying the work area appears to be a violation of Technical Specification 6.12, which requires that individuals entering high radiation areas be provided appropriate radiation monitoring devices. (255/84-06-02)

IE Information Notice No. 82-31, "Overexposure of Diver During Work in Fuel Storage Pool," dated July 28, 1982, recommends that daily surveys of the work area be conducted and documented using two independent radiation exposure monitoring devices. Also, the notice recommends the diver carry a remote readout radiation detector which can be monitored by a technician and that the diver be equipped with an alarming dosimeter. Although these recommendations were related to diving work in spent fuel pools with spent fuel present, implementation of these recommendations during repair of the refueling cavity tilt machine should have identified the higher than anticipated radiation levels in which the diver was present, thereby preventing the unplanned exposure.

The survey instrument used for all underwater radiation surveys was a "cutie pie" (CP-MU) equipped with a large volume ionization chamber (7.5 inches long and 5.0 inches in diameter) at the end of a 40 foot long cable. Through observations and discussions with technicians who had performed surveys with this instrument, the inspectors learned that the detector was difficult to position underwater and was repeatedly malfunctioning. Also, the technicians stated that due to the apparent fragile condition of the detector, they tended to limit its use. Because of its large volume, fragile physical condition, and the difficulty experienced in manipulating the detector into the hard-to-reach areas of the tilt pit, it appears this detector was not an appropriate choice for this application.

Detectors which could be easily manipulated by the divers during performance of needed surveys and used for high radiation area monitoring purposes were not available onsite. This matter was discussed during the exit meeting and will be reviewed during a future inspection. (255/84-06-03).

5. Job Planning and Control

In the past, the licensee has used divers to perform underwater maintenance in both the spent fuel pool and the reactor vessel. Several years ago, divers were used to perform spent fuel storage rack modifications in the spent fuel pool, and earlier in this outage, divers were used to assist with installation of cold leg dams inside the reactor vessel and for removing miscellaneous debris from the bottom of the reactor vessel. According to the licensee, no unusual exposures occurred during these previous diving operations.

Discussions with persons involved with the refueling cavity tilt machine diving operations and review of available records revealed that certain job planning and control weaknesses contributed to the cause of the unanticipated exposure. These include: lack of a formal ALARA review; lack of a formal procedure for radiological diving operations; inadequate prejob briefing and shift turnover; inadequate health physics supervision; and lack of a stop work order after identification of unexpected high dose rates.

Normally, determination as to ALARA review requirements is made by the planning and scheduling group based on review of the maintenance order, or by the radiation protection technician handling the RWP for the work. Apparently, no maintenance order was generated for the refueling cavity tilt machine repair work. The inspector determined, through discussions with the Health Physicist - ALARA, that an ALARA review of the refueling cavity tilt machine repair job was not conducted. Administrative Procedure No. 7.02, "ALARA Program," requires that an ALARA review be conducted if (among other reasons): the potential exists for individual exposure to general area radiation levels greater than or equal to 1000 mrems/hour; if an individual is expected to receive greater than 1500 mrems whole body dose in a given calendar year for a given task; or if loose surface contamination exceeds 100,000 dpm/100 cm^2. Based on the results of the March 16, 1984 survey (900 mrems/hour maximum) and the January 1984 survey of the tilt machine area when drained, which showed radiation levels up to 15,000 mrems/hour, it would appear that there was a real potential for general work area dose rates of greater than 1000 mrems/hour and therefore an ALARA review was needed. Also, stay time calculations which indicated planned exposures greater than 1500 mrems and radiation work permit contamination levels which far exceeded 100,000 dpm/100 cm^2, dictated the need for an ALARA review. According to the Health Physicist - ALARA, if an ALARA review had been conducted, he would have entered a requirement on the RWP to have the survey instrument detector with the diver at all times while underwater. In addition, based on the March 18,1984 "B" day shift surveys, the radiation work permit should have been cancelled before the diving operations began because of the significant change in expected radiation levels from those identified by the March 16, 1984 survey. The March 18, 1984 survey of the refueling cavity tilt machine area indicated dose rates up to 7000 mrems/hour, while the March 16, 1984 survey used to generate the radiation work permit, indicated dose rates up to only 900 mrems/hour. Procedure No. 7.03, "Radiation Work Permit," requires that a job be stopped if unplanned changes in working conditions occur.

Failure to conduct the required ALARA review of the refueling cavity tilt machine repair job, and failure to stop the job after radiation levels significantly higher than those indicated on the radiation work permit were identified, is an apparent violation of Technical Specification 6.11, which requires adherence to radiation protection procedures. (255/84-06-04)

Discussions with health physics management revealed that they assumed the diver would be instructed to carry the radiation detector with him at all times while underwater. However, it appears that none of the radiation protection technicians including the crew leaders, were aware of this instruction. Except for a draft radiological work plan for underwater diving operations written following previous diving operations into the reactor vessel, there was no formalized procedure detailing the special precautions or survey requirements necessary to provide effective job coverage during radiological diving operations. In addition, the radiation work permit did not include survey requirements. This appears to be a violation of Procedure No. HP 2.14, "Radiological Survey Requirements," which states that survey requirements be included on the radiation work permit. (255/84-06-04)

Health physics supervision for the diving operations was the responsibility of the duty health physicist. Reporting to the duty health physicist was the dosimetry and containment radiation protection crew leaders and their assigned radiation protection technicians. Although it appears the divers were well briefed as to the mechanics of making the repairs, the radiation protection organization responsible for health physics supervision of the work did not receive a formal prejob briefing related to the radiation protection aspects of the job. In addition, survey information vital to the job was apparently not well communicated to the "C" shift by the "B" shift during counterpart turnover discussions. "B" shift radiation protection crew members stated that the needed information was discussed with oncoming "C" shift personnel. However, "C" shift radiation protection crew members recall no such discussions. This, combined with a technician relief cycle of about two hours, whereby the radiation protection technicians covering the job were relieved after two hours in containment while the second dive was in progress, suggests that the number of persons involved in the job may have been excessive and contributed to an overall discontinuity in the job coverage.

Another problem which contributed to an overall communication/management control weakness was that the duty health physicist did not observe the work while in progress to determine if work was progressing as per management expectations. His direct observation of the work in progress may have resulted in identification of the survey and communication weaknesses. These matters were discussed during the exit meeting.

6. External Exposure and Dosimetry

Dosimetry placement for the refueling cavity tilt machine repair job was preplanned by the dosimetry crew leader. Dosimetry placed inside the diver's suit included plant TLDs on both hands, both feet, both

thighs just above the knee, the head, the chest, one shoulder, and one buttock. The plant TLDs are considered secondary dosimetry devices which are used for short term dose control. A $CaSO_4$ teflon wafer CPCo general office TLD is used by the licensee for the official dose records for workers. The general office (GO) TLD badge was initially attached inside the suit on the left thigh just above the knee. Following the second dive, the GO TLD badge was moved to the right thigh just above the knee. Dosimetry outside the diver's suit included secondary TLDs on both hands, the chest, the left thigh, and the right foot. Also, self-reading dosimeters were attached outside the suit on both thighs and on the diver's chest. The secondary TLDs outside the suit were not used during the third dive.

Stay times for the diver were calculated by the dosimetry crew leader in order to maintain the diver's dose less than the licensee's administrative limit of 2500 mrems/quarter. The stay time for the first dive was based on a contact dose rate of 10 R/hr from a survey of the refueling cavity in an unflooded condition on January 19, 1984, according to licensee personnel and the stay time record. However, review of the January 19, 1984 survey results showed that approximately six inches of water was present in the refueling cavity tilt pit at the time of the survey, and that the measured dose rates increased with distance into the tilt pit, from 300-500 mR/hr at the refueling cavity floor to 15,000 mR/hr approximately two feet above the tilt pit floor. According to a licensee radiation protection technician, a 30,000 mR/hr dose rate was found near the water surface but not recorded. As the major radiation source in the tilt pit was assumed to be from radioactive contamination which had accumulated on the tilt pit floor, dose rates would be expected to increase even further as the floor was approached. As the water in the flooded tilt pit provided shielding for the hydraulic work, and for the first dive at least the diver was not expected to be lying or kneeling extensively on the tilt pit floor, the stay time calculation for the first dive appears appropriate.

Following the first dive, secondary TLDs outside the diving suit ranged from approximately 50 mrems at the head, chest, left thigh, and right hand to approximately 250 mrems at the right foot. The maximum TLD result was utilized to determine the remaining allowable stay time (60 minutes) permitted without exceeding the licensee's administrative limit of 2500 mrems. This stay time was then conservatively cut by 50 percent to allow for possible changes in the diver's body position between the first and second dives.

Following the second dive, the secondary TLDs both inside and outside the diving suit were counted. The outside secondary TLDs ranged from less than 50 mrems for the head and chest to approximately 850 mrems at the right foot. The inside secondary TLDs (total for first and second dives) ranged from less than 50 mrems at the head to approximately 1250 mrems at the right foot. Although differences existed, the inside and outside secondary TLDs were in reasonable agreement. As it appeared that the lower right side of the diver's body was receiving a larger radiation exposure than the left side, the GO TLD badge was repositioned

from the left thigh (just above the knee) to a similar location on the right thigh. Based on the highest TLD results from the first two dives, the stay time calculation for the second dive appeared reasonably accurate, and it was utilized for the third dive also. A stay time of 40 minutes was calculated for the third dive.

Following the third dive, the secondary TLDs inside the diving suit were counted. The TLDs ranged from approximately 50 mrems at the chest to approximately 3600 mrems at the right thigh (just above the knee). The right thigh dose, used by the dosimetry crew leader as the controlling whole body dose, was approximately 250 percent of the planned dose. Cumulative doses for the three dives, based on the secondary TLDs inside the diving suit, ranged from approximately 100 mrems at the head and chest to 500 mrems at the hands, to 1100 mrems at the left thigh, to 1500 mrems at the left foot, to 2250 mrems at the right foot, to 4450 mrems at the right thigh. The GO (official) TLD badge, which was on the left thigh for the first and second dives and on the right thigh for the third dive read 4630 mrems. This compares favorably with the secondary TLDs at those locations which totaled 4250 mrems for the three dives.

The dosimetry indicated a severe dose gradient over the diver's body in all three of the dives. The existence of a dose gradient was anticipated by the licensee due to prejob surveys. What was apparently not appreciated by licensee personnel was the potential for much higher localized dose rates than the approximate 2 rems/hour measured by the diver's highest TLDs for the first and second dives. According to the diver, work performed on the first dive consisted of a quick appraisal of the work site and required work. Consequently he moved about the tilt pit rather than remaining in one or two specific locations. During the second dive, the majority of his time was spent a few feet above the tilt pit floor while working on the hydraulic lines and manifold. During the third dive, he was several feet off the tilt pit floor for about one-half of the dive but spent the other one-half of the dive kneeling on the floor. It appears that the right thigh TLD, which was within three to six inches of the floor while the driver was kneeling, was in a radiation field of approximately 10-15 R/hr during this one-half of the third dive.

As defined in 10 CFR 20.101, whole body dose includes any dose to the whole body, gonads, active blood forming organs, head and trunk, or lens of the eye. In evaluating the whole body dose to the diver for the three dives, the licensee concluded that the GO badge result reflected extremity dose rather than whole body dose. This conclusion was based on ICRP Publication 23, "Report of the Task Group on Reference Man," which indicates that by the postnatal age of 25 years, the femur shaft no longer contains hematopoietically active tissue (red bone marrow). By that age, the active blood forming organs in reference man are located predominantly in the vertebrae, sternum, iliac crest (pelvic region), and ribs. The age of the diver (male) involved in this incident was 30 years. Based on the above conclusion, the highest recorded whole body dose was about 425 mrems (404 mrems from secondary

TLDs plus 19 mrems from previous whole body TLD) to the right buttock, which should be generally representative of the iliac crest (pelvic region). This dose is supported as being generally representative of the iliac crest by the hand TLDs which were generally in the same horizontal plane as the buttock TLD (and the iliac crest) but on the opposite side of the iliac crest during the dives. The recorded doses to the right and left hands for the three dives were 470 mrems and 459 mrems, respectively.

Recorded doses to the diver's chest, left shoulder, and head were all significantly less than the buttock and hand doses. The licensee conservatively calculated a whole body dose for the diver of 1620 mrems. This calculation, for the midfemur location, was based on a calculated gonadal dose of 437 mrems (extrapolated from hand and buttock recorded doses), the recorded right knee dose of 4630 mrems, and an assumed logarithmic dose function between the knee and the gonads. Although this calculation is not rigorous due to uncertainties concerning the diver's body position in relation to the radiation source and the nature of the radiation source(s), it was judged by the licensee to result in a reasonably conservative estimate of whole body dose.

This event was reviewed by the NRC Headquarters technical and legal staffs as well as the Region III staff. It was determined that the dose limit for that portion of the thigh that received a recorded dose of 4630 mrems was 3 rems per quarter (whole body dose) and not the 18.75 rems per quarter limit applicable to the feet and ankles. The 4630 mrems dose to the thigh is an apparent violation of 10 CFR 20.101 (255/84-06-5).

7. TMI Action Plan Item II.B.3 "Post Accident Sampling"

The inspectors reviewed licensee actions taken to satisfy the clarifications of NUREG-0737, Item II.B.3., "Post Accident Sampling." The review included discussions with cognizant chemistry and health physics personnel, observation of system operation (see Inspection Report No. 50-255(82-29), and review of the Safety Evaluation of the Post-accident Sampling System by NRR dated January 23, 1984. Based on the above, it appears the licensee has satisfied the clarification items for collecting and analyzing post-accident liquid samples and analyzing containment atmosphere samples. However, the licensee's ability to collect containment atmosphere samples remains incomplete pending repair of a valve in the hydrogen gas sampling line which will also be used for obtaining containment atmosphere samples. This work is scheduled to be completed before the end of the current refueling and maintenance outage. This matter will be reviewed further and closed out by the resident inspector.

8. Exit Meeting

The inspectors met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on March 23, 1984. Further discussions were conducted during a telephone conversation between the

nspectors and licensee management on April 6, 1984. The inspector summarized the scope and findings of the inspection. In response to certain matters discussed by the inspectors, the licensee stated that tilt machine repairs would be completed after decontamination efforts were completed and that in addition to detailed prejob surveys, the diver would carry the detector with him to the work area.

9. Enforcement Conference

An enforcement conference was held on April 27, 1984, to discuss the circumstances surrounding the unplanned radiation exposure received by a worker during diving operations in the refueling cavity, Region III's concerns related to the event, and the apparent violations. The meeting, held at the Region III office, was attended by Mr. A. B. Davis, Deputy Regional Administrator, NRC, Region III, and Mr. R. B. DeWitt, Vice President, Nuclear Operations, Consumers Power Company, and members of their staffs.

The licensee was informed that the incident was being considered for escalated enforcement action due to the substantial potential for exceeding the quarterly dose limit. It was noted that an incident involving radiological diving work was presented in IE Information Notice No. 82-31, but that this information was not fully utilized at Palisades. Other factors being considered were the licensee's improved performance in the area of radiation protection over the past few years and the licensee's prompt reporting and evaluation of the incident.

Licensee representatives described initiatives to improve their performance in this area, including:

a. Develop a Radiation Work Plan for radiological diving work. This effort has been completed.

b. Establish a policy whereby work in areas greater than 1 R/hr requires the presence onsite of a health physics management individual.

c. Procure more reliable underwater survey instrumentation and perform underwater surveys using two instruments.

d. Initiate periodic decontamination of the fuel pool and reactor cavity tilt pits to reduce accumulation of high activity crud.

e. Review the incident with health physics supervisors and technicians and promulgate lessons learned to other Radiation Safety groups and to NOTD (training). This effort has been completed.

In attendance at the enforcement meeting were:

U. S. Nuclear Regulatory Commission

A. Davis, Deputy Regional Administrator
J. Hind, Director, Division of Radiological Material Safety Programs
C. Paperiello, Chief, Emergency Preparedness and Radiological Safety Branch
S. Lewis, Regional Attorney
P. Lovendale, Senior Radiation Specialist
B. Jorgensen, Senior Resident Inspector

Consumers Power Company

R. DeWitt, Vice President, Nuclear Operations
R. Montross, Plant Manager, Palisades
D. VandeWalle, Director, Nuclear Licensing
W. Mullins, Chemistry/Health Physics Superintendent
R. English, Corporate Health Physicist

In a telephone conversation with Mr. T. Elward (CPCo) on July 3, 1984, Messrs. Hind, Paperiello, Greger, and Boyd (Region III) informed the licensee that the diver's exposure was considered a whole body over-exposure per 10 CFR 20.101.